

# **CRE and *C. difficile*: Is Your Healthcare Facility Implementing the Necessary Approach to Stop the Spread?**

**Clinician Outreach and  
Communication Activity (COCA)  
Webinar  
August 20, 2015**

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**Planners have reviewed content to ensure there is no bias. This presentation will not include any discussion of the unlabeled use of a product or products under investigational use.**

# Objectives

**At the conclusion of this session, the participant will be able to:**

- ❑ **Discuss the current state of antibiotic-resistant bacteria in U.S. healthcare facilities**
- ❑ **Identify mechanisms that can be used to identify gaps in antibiotic stewardship and help charter a course of action to decrease the spread of antibiotic-resistant infections**
- ❑ **Describe how healthcare organizations and public health can collaborate to stop the spread of antibiotic-resistant germs and *C. difficile* between facilities**

# TODAY'S MODERATOR & PRESENTER



**Arjun Srinivasan, MD**

Associate Director

Healthcare-Associated Infection Prevention

Division of Healthcare Quality Promotion

Centers for Disease Control and Prevention (CDC)

# Antibiotic Resistance in the U.S.

- Sicknesses >2 million people/year
- Kills at least 23,000 people/year, plus 15,000/year from *C. difficile*
- >\$20B/year in health care costs
- Threat to economic stability
- Need to act now or even drugs of last resort will soon be ineffective



**2 Million**

Antibiotic-resistant germs cause more than **2 million illnesses** and at least **23,000 deaths** each year in the US.



**Vital**signs™

[www.cdc.gov/vitalsigns/stop-spread](http://www.cdc.gov/vitalsigns/stop-spread)



**ANTIBIOTIC RESISTANCE THREATS**  
in the United States, 2013



USA TODAY 11.29.12

**DRUGS CAN'T STOP THIS KILLER**

In the past decade, bacteria that resist even "drugs of last resort" have spread to health care facilities in 42 states.



**CLOSTRIDIUM DIFFICILE**

500,000 INFECTIONS IN 2011    15,000 DEATHS IN 2011

WE ESTIMATE THAT UP TO **\$3,800,000,000** IN MEDICAL COSTS COULD BE SAVED OVER 5 YEARS

THREAT LEVEL **URGENT** ○○○○○○

# Challenge. Action. Change.

2012

**Vitalsigns**  
March 2012

## Making Health Care Safer

### Stopping *C. difficile* infections

**3X** Hospital stays from *C. difficile* infections reported in the last decade, partly a result of safety issues especially harmful to older Americans.

**94%** of all *C. difficile* infections are prevented by getting medical care.

**20%** Hospital inpatient infections caused by *C. difficile* infections rose by 20% in the last 10 years.

People getting medical care can catch serious infections called health care-associated infections (HAIs). While most types of HAIs are preventable, one – caused by the germ *C. difficile* – remains at historically high levels. *C. difficile* causes diarrhea, blood in stool, and pain. It is especially dangerous for older Americans, who take antibiotics and also get medical care. When a person takes antibiotics, good germs that protect against infections are destroyed for several weeks. During this time, patients can get sick from *C. difficile* picked up from contaminated surfaces or spread from a health care provider's hands. About 25% of *C. difficile* infections first show symptoms in hospital patients; 75% first show in nursing home patients or in people usually cared for in doctors' offices and clinics. *C. difficile* infections cost at least 5 billion in extra health care costs annually.

For more information, visit <http://www.cdc.gov/hai>

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Division of Healthcare Quality Promotion

**Vitalsigns**  
March 2013

## Making Health Care Safer

### Stop Infections from Lethal CRE Germs Now

**4% & 18%** About 4% of US hospitals had at least one patient with a CRE bloodstream infection among the first half of 2012. About 18% of long-term acute care hospitals had one.

**42** states have reported at least one CRE bloodstream infection during the first 6 months of 2012.

**1 in 2** CRE germs kill up to half of patients who get bloodstream infections from them.

Unavoidable and hard-to-treat infections from CRE germs are the rise among patients in medical facilities. CRE germs have become resistant to other drugs called carbapenems and polymyxins. By following CDC guidelines, we can halt CRE infections before they get widespread in hospitals and other medical facilities and potentially spread to otherwise healthy people outside of medical facilities.

Health Care Providers can:

- Know if patients in your facility have CRE.
- Request immediate alerts when the lab identifies CRE.
- Alert the receiving facility when a patient with CRE transfers, and find out when a patient with CRE transfers into your facility.
- Protect your patients from CRE.
- Public safety precautions and hand hygiene recommendations when treating patients with CRE.
- Dedicate rooms, staff, and equipment to patients with CRE.
- Prevent antibiotic misuse.
- Remove temporary medical devices such as catheters and ventilators from patients as soon as possible.

Want to learn more? Visit <http://www.cdc.gov/hai>

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**WE HAVE TO STOP IT BEFORE IT SPREADS TO THE COMMUNITY**

**9,000** INFECTIONS PER YEAR

**600** DEATHS

**WE ESTIMATE THAT UP TO \$2.4 BILLION IN MEDICAL COSTS COULD BE SAVED OVER 5 YEARS**

**THREAT LEVEL URGENT**

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Division of Healthcare Quality Promotion

2013

**ANTIMICROBIAL RESISTANCE**  
Global Report on Surveillance  
2014

© 2014 World Health Organization

**REPORT TO THE PRESIDENT ON COMBATING ANTIBIOTIC RESISTANCE**

**NATIONAL STRATEGY FOR COMBATING ANTIBIOTIC-RESISTANT BACTERIA**

September 2013

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Division of Healthcare Quality Promotion

2014

**Review on Antimicrobial Resistance**  
Tackling a crisis for the health and wealth of nations

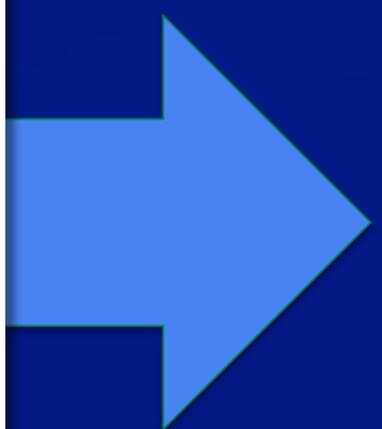
The Review on Antimicrobial Resistance  
Chaired by Jim O'Neill  
December 2014

2015

**NATIONAL ACTION PLAN FOR COMBATING ANTIBIOTIC-RESISTANT BACTERIA**

MARCH 2015

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WASHINGTON



# Combatting Antibiotic Resistance: A Coordinated Approach

## Key actions

needed:

- Infection control
- Stewardship
- Surveillance

## Facilities work together to protect patients.

### Common Approach *(Not enough)*

- Patients can be transferred back and forth from facilities for treatment without all the communication and necessary infection control actions in place.

### Independent Efforts *(Still not enough)*

- Some facilities work independently to enhance infection control but are not often alerted to antibiotic-resistant or *C. difficile* germs coming from other facilities or outbreaks in the area.
- Lack of shared information from other facilities means that necessary infection control actions are not always taken and germs are spread to other patients.

### Coordinated Approach *(Needed)*

- Public health departments track and **alert** health care facilities to antibiotic-resistant or *C. difficile* germs coming from other facilities and outbreaks in the area.
- Facilities and public health authorities share information and implement shared infection control actions to stop spread of germs from facility to facility.



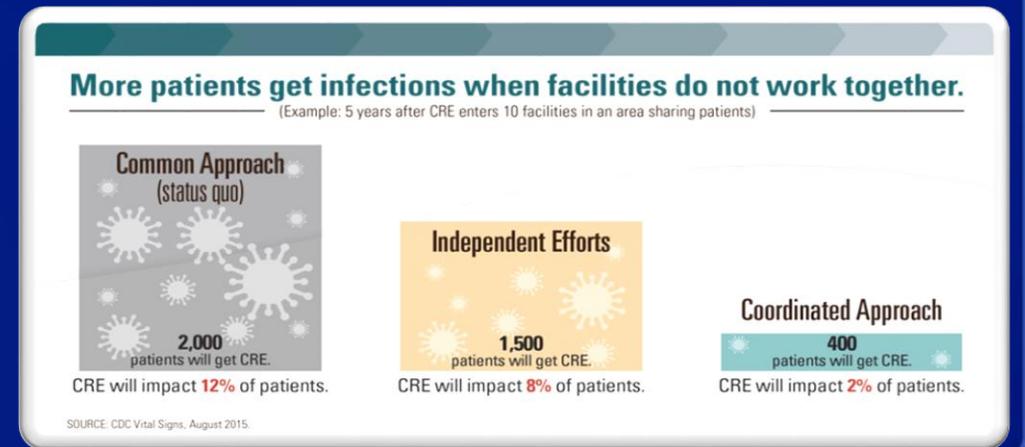
# Forward Looking Approach: Investments Needed

- Now we have a clear sense not only how bad the problem is, but also what needs to be done, and what the benefits of doing it will be
- Now it is up to Congress to support the resources needed to protect Americans from drug-resistant bacteria and the risk of a post-antibiotic age that undermines many life-saving procedures of modern medicine



**70%**  
Up to 70% fewer patients will get CRE over 5 years if facilities coordinate to protect patients.

 **Vitalsigns**<sup>™</sup>  
www.cdc.gov/vitalsigns/stop-spread



**What We Can Do Right Now?**

# TODAY'S PRESENTER



## **Robert A. Weinstein, MD**

C Anderson Hedberg MD Professor of Internal Medicine  
Chief Academic Officer  
Rush University Medical Center

# TODAY'S PRESENTER



**Sara Cosgrove, M.D., M.S., FSHEA, FIDSA**

Associate Hospital Epidemiologist

Director, Antimicrobial Stewardship Program

Associate Professor of Medicine

Johns Hopkins University School of Medicine

# The Chicago Experience with Regional Spread and Control of Carbapenem-resistant Enterobacteriaceae (CRE)

Robert A. Weinstein, MD

August 20, 2015

Cook County Health & Hospitals System

Rush Medical College

Disclosures: Sage Inc (Remote) & CDC (Current) Funding

The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry



# This Is Not A New Problem

## Multiple Antibiotic–Resistant *Klebsiella* and *Escherichia coli* in Nursing Homes

Janis Wiener, MD

John P. Quinn, MD

Patricia A. Bradford, PhD

Richard V. Goering, PhD

Catherine Nathan, MS

Karen Bush, PhD

Robert A. Weinstein, MD

**A**NTIBIOTIC RESISTANCE AMONG nosocomial pathogens is a cause of major concern.<sup>1-3</sup> Three aspects of this problem have been particularly challenging: the frequent emergence of resistance to the newest antibiotics; the presence of antibiotic resistance genes on bacterial plasmids, which may be transferred among different bacterial species; and the spread of resistant bacteria among patients not only in the hospital but also in the community.

**Context** Infections caused by ceftazidime sodium–resistant gram-negative bacteria that harbor extended-spectrum  $\beta$ -lactamases (ESBLs) are increasing in frequency in hospitals in the United States.

**Objectives** To report a citywide nursing home–centered outbreak of infections caused by ESBL-producing gram-negative bacilli and to describe the clinical and molecular epidemiology of the outbreak.

**Design** Hospital-based case-control study and a nursing home point-prevalence survey. Molecular epidemiological techniques were applied to resistant strains.

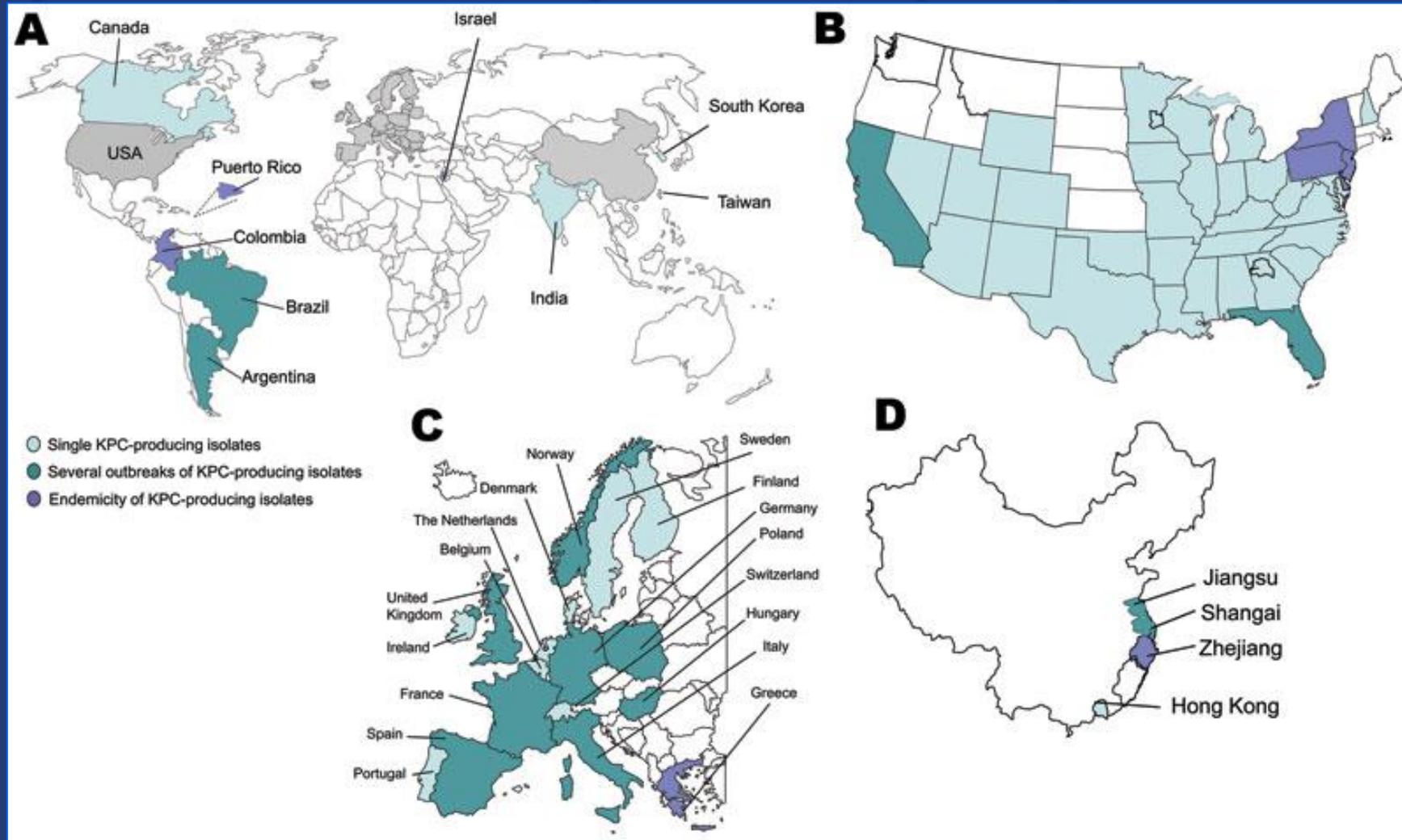
**Settings** A 400-bed tertiary care hospital and a community nursing home.

**Patients** Patients who were infected and/or colonized with ceftazidime-resistant *Escherichia coli*, *Klebsiella pneumoniae*, or both and controls who were admitted from nursing homes between November 1990 and July 1992.

**Main Outcome Measures** Clinical and epidemiological factors associated with colonization or infection by ceftazidime-resistant *E coli* or *K pneumoniae*; molecular genetic characteristics of plasmid-mediated ceftazidime resistance.

**Results** Between November 1990 and October 1992, 55 hospital patients infected or colonized with ceftazidime-resistant *E coli*, *K pneumoniae*, or both were identified. Of the 35 admitted from 8 nursing homes, 31 harbored the resistant strain on admission. All strains were resistant to ceftazidime, gentamicin, and tobramycin; 96% were resistant to trimethoprim-sulfamethoxazole and 41% to ciprofloxacin hydrochloride. In a case-control study, 24 nursing home patients colonized with resistant strains on

# Worldwide Geographic Distribution of *Klebsiella pneumoniae* Carbapenemase (KPC) Producers



# Emergence & Rapid Regional Spread of *K pneumoniae* Carbapenemase-Producing Enterobacteriaceae

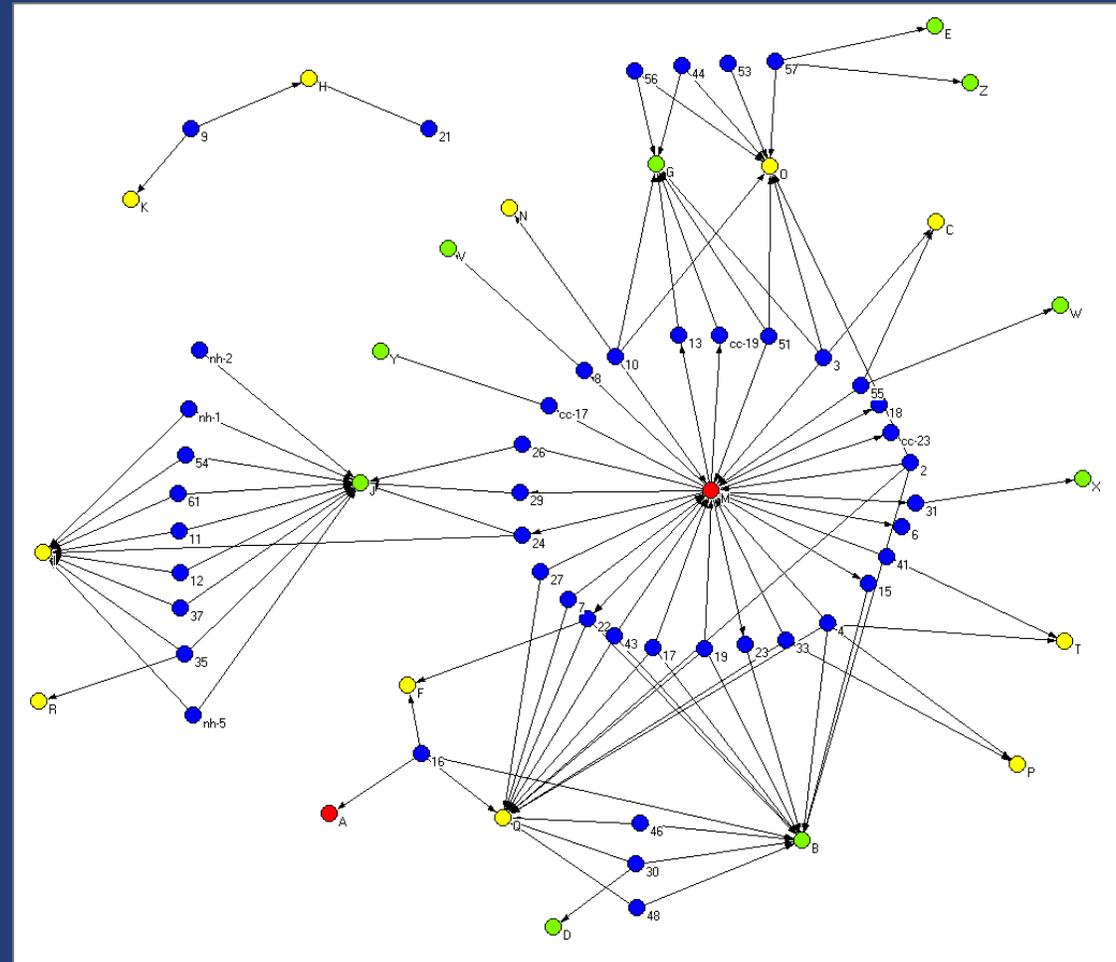
## HOSPITAL AND LONG-TERM CARE INTERRELATIONS

**Social Network** depiction of LTACH, Nursing Home, & Hospital spread of KPC (Carbapenem-resistant *Klebsiella pneumoniae*)

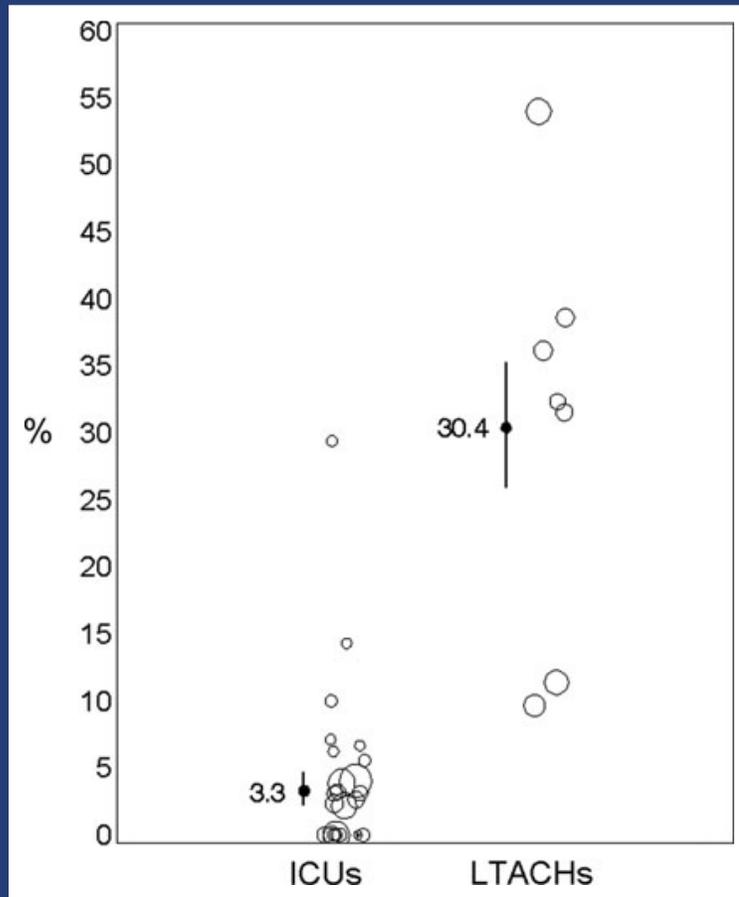
### LEGEND

- LTACH
- NURSING HOME
- ACUTE HOSPITAL
- PATIENT

LTACH, Long term acute care hospital; MDRO, Multidrug resistant organism



# The Importance of Long-term Acute Care Hospitals in the Regional Epidemiology of *Klebsiella pneumoniae* Carbapenemase-Producing Enterobacteriaceae (KPC)



**KPC colonization prevalence 9-fold higher in LTACHs than in short-stay acute care hospital adult ICUs**

LTACH, Long-term acute care hospital; ICU, intensive care unit

# Developing Control Measures --The Fecal Patina?

## KPC Common on Skin but Rare in Most Environmental Sites of LTACH Patients

- 22/24 (92%) patients  $\geq 1$  skin site KPC-positive
  - 49/96 (51%) skin cultures KPC-positive
- 2/371 (0.5%) environmental sites in patient rooms or common areas grew KPC
- Environmental site of concern: SINKS?

KPC, *Klebsiella pneumoniae* carbapenemase;  
LTACH, long-term acute care hospital

# Prevention of Colonization and Infection by *Klebsiella pneumoniae* Carbapenemase-Producing Enterobacteriaceae in Long-term Acute-Care Hospitals

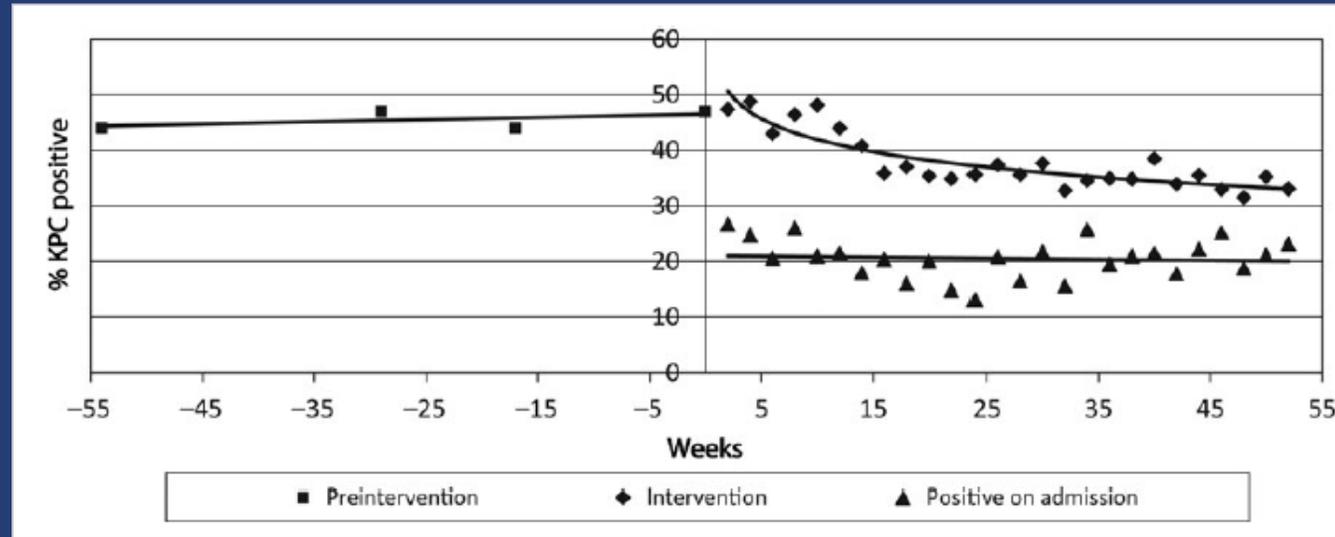
Mary K. Hayden,<sup>1,2</sup> Michael Y. Lin,<sup>1</sup> Karen Lolans,<sup>2</sup> Shayna Weiner,<sup>1</sup> Donald Blom,<sup>1</sup> Nicholas M. Moore,<sup>3</sup> Louis Fogg,<sup>4</sup> David Henry,<sup>5</sup> Rosie Lyles,<sup>6</sup> Caroline Thurlow,<sup>1</sup> Monica Sikka,<sup>1</sup> David Hines,<sup>7</sup> and Robert A. Weinstein<sup>1,6</sup>; for the Centers for Disease Control and Prevention Epicenters Program

Departments of <sup>1</sup>Medicine, Division of Infectious Diseases, <sup>2</sup>Pathology, <sup>3</sup>Medical Laboratory Science, and <sup>4</sup>Nursing, Rush University Medical Center, <sup>5</sup>Department of Biostatistics, University of Illinois School of Public Health, <sup>6</sup>Department of Medicine, Division of Infectious Diseases, Cook County Health and Hospital System, and <sup>7</sup>Metro Infectious Disease Consultants LLC, Chicago, Illinois

		Staggered Introduction of Intervention				
		February 1, 2010 – November 27, 2011	November 28, 2011 – February 4, 2012	February 5, 2012 – April 8, 2012	April 9, 2012 – June 17, 2012	June 18, 2012 – June 30, 2013
LTACH	A	0	X	X	X	X
	B	0	0	X	X	X
	D	0	0	0	X	X
	C	0	0	0	0	X

X = Intervention Bundle Introduced

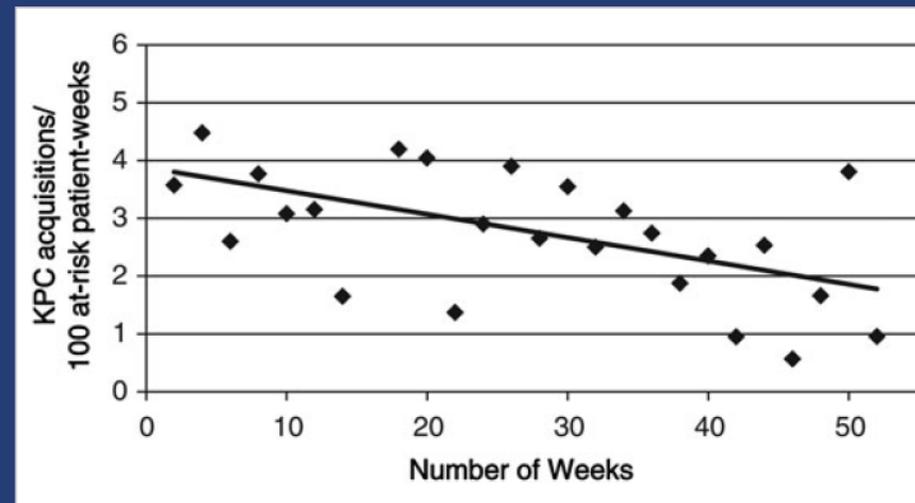
# Prevalence rate of KPC-producing Enterobacteriaceae rectal colonization



## Incidence rate of KPC-producing Enterobacteriaceae rectal colonization during the intervention period

### INTERVENTION BUNDLE

- Admission & every other week rectal culture screening
- Contact precautions; cohorts or private rooms
- Daily bathing with chlorhexidine-impregnated cloths
- HCW education & adherence monitoring

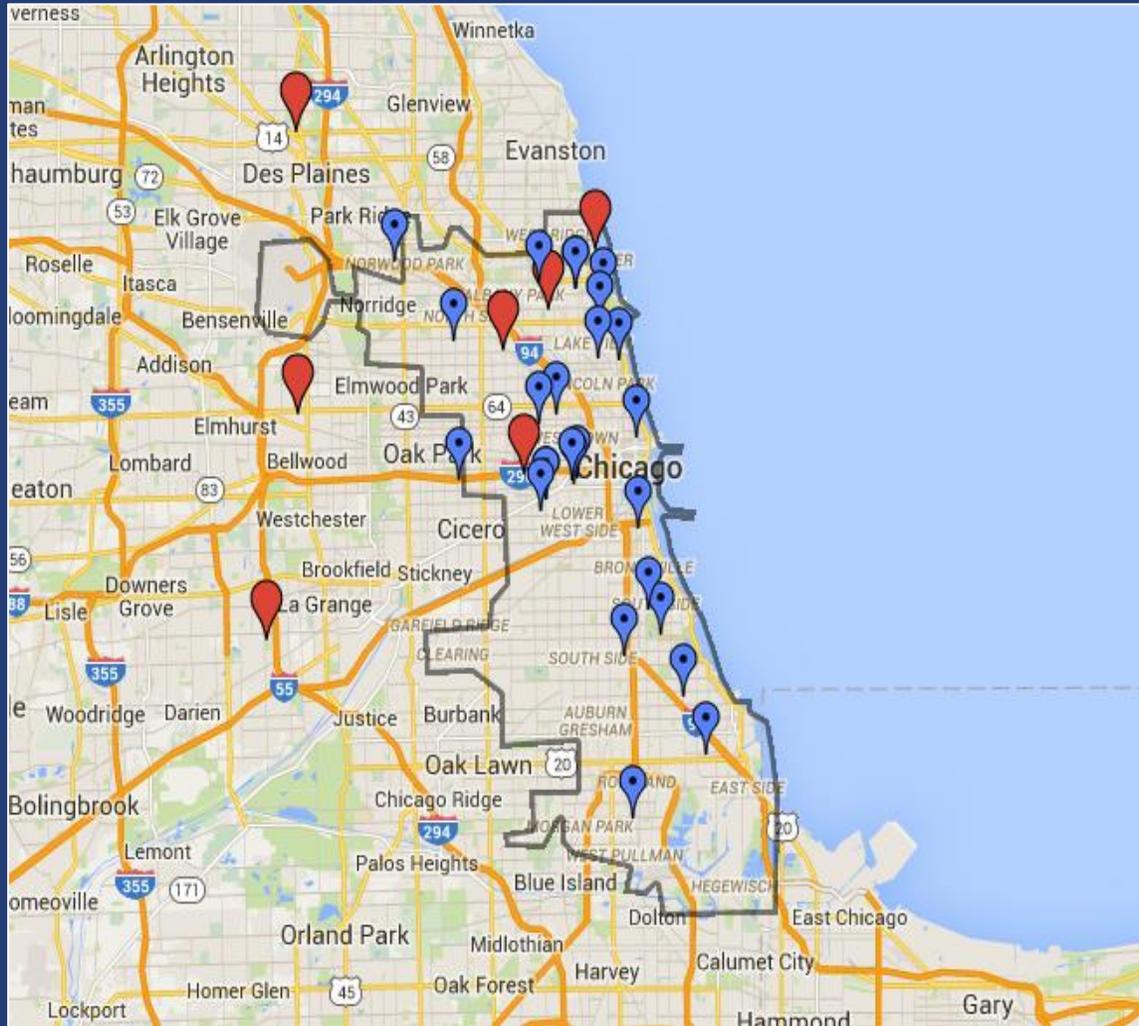


# Effect of Bundled Intervention on Positive Clinical Cultures at 4 LTACHs

	Pre-Intervention		Intervention		P-value
	No. of events	Events/ 1000 pt-days	No. of events	Events/ 1000 pt-days	
KPC in any clinical culture	656	3.7	285	2.5	.001
KPC bloodstream infection	165	0.9	48	0.4	.008
Bloodstream infection due to any pathogen	2004	11.2	870	7.6	.006

LTACH, long-term acute care hospital;  
KPC, *Klebsiella pneumoniae* carbapenemase

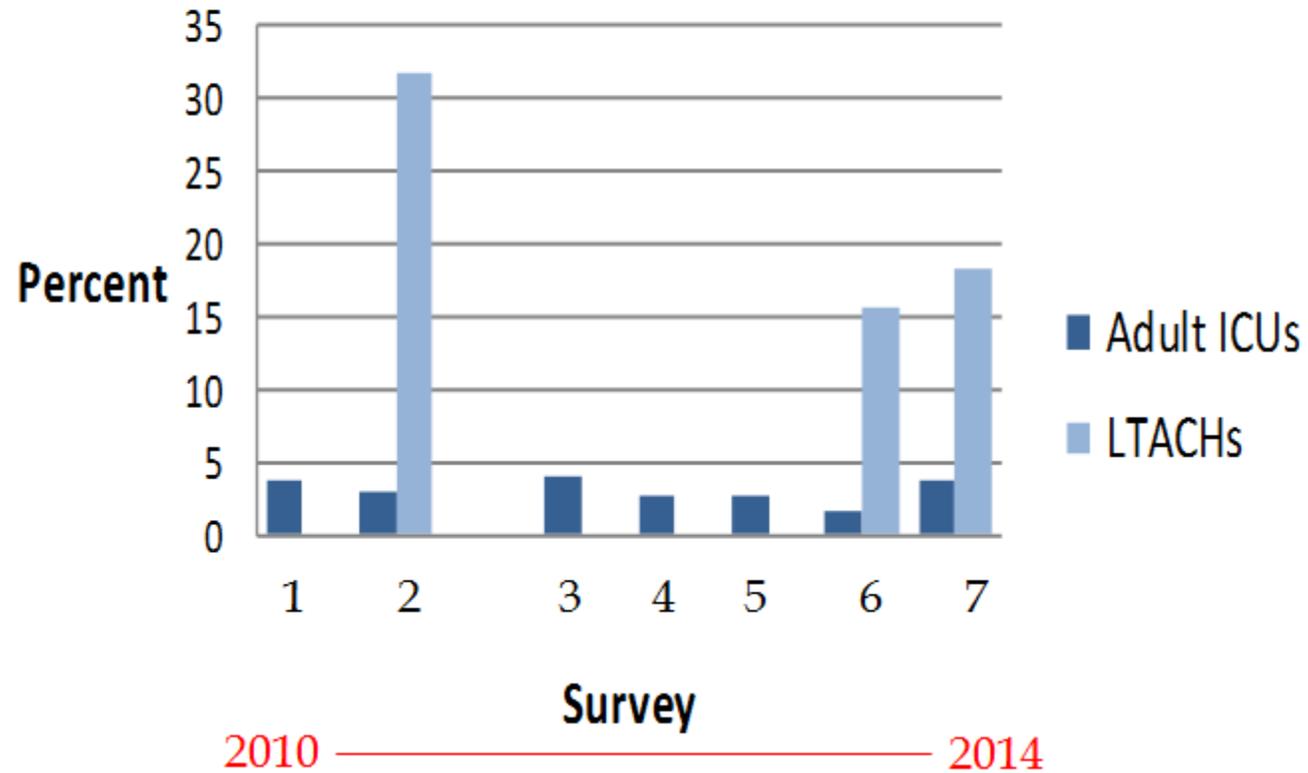
# REALM Project – ICU & LTACH Surveillance for KPC



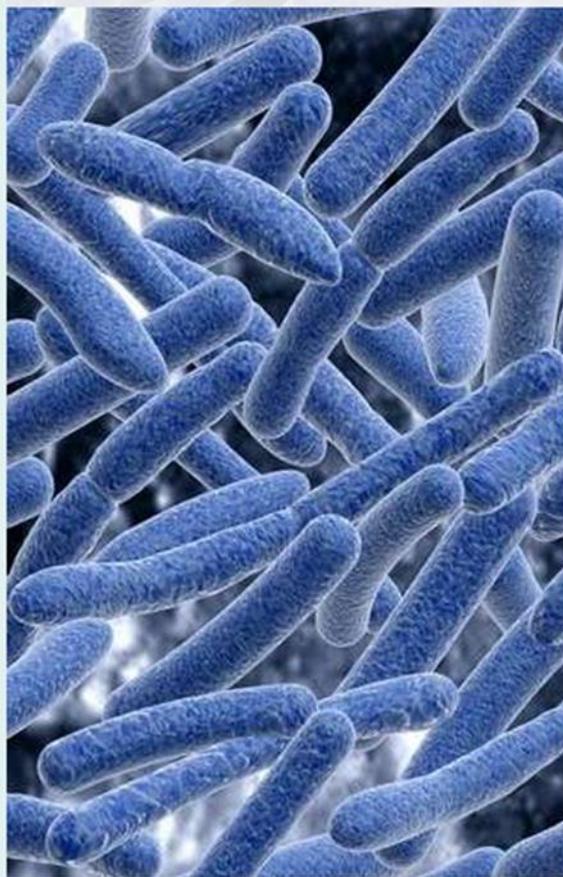
Hospital ICUs (blue)  
LTACHs (red)

REALM, Regional Evaluation of Legislative Mandate to screen patients for MRSA;  
LTACH, Long-term acute care hospital; KPC, *Klebsiella pneumoniae* carbapenemase

## Prevalence of KPC Colonization among ICU vs. LTACH Patients



KPC, *Klebsiella pneumoniae* carbapenemase; ICU, Intensive Care Unit; LTACH, Long-term acute care hospital



Carbapenem-resistant Enterobacteriaceae (CRE) are extremely drug resistant organisms (XDR0s) that have few treatment options and high mortality rates. CRE are increasingly detected among patients in Illinois, including acute and long term care healthcare facilities.

In response to the CRE public health threat, the Illinois Department of Public Health (IDPH) has guided development an infection control tool called the XDR0 registry. The purpose of the XDR0 registry is two-fold:

1. **Improve CRE surveillance:** The first CRE-positive culture per patient stay must be reported to the XDR0 registry.
2. **Improve inter-facility communication:** Healthcare facilities can query the XDR0 registry to see whether a patient has been previously reported as CRE-positive.

For access to the XDR0 registry, click [here](#)

## UPDATES

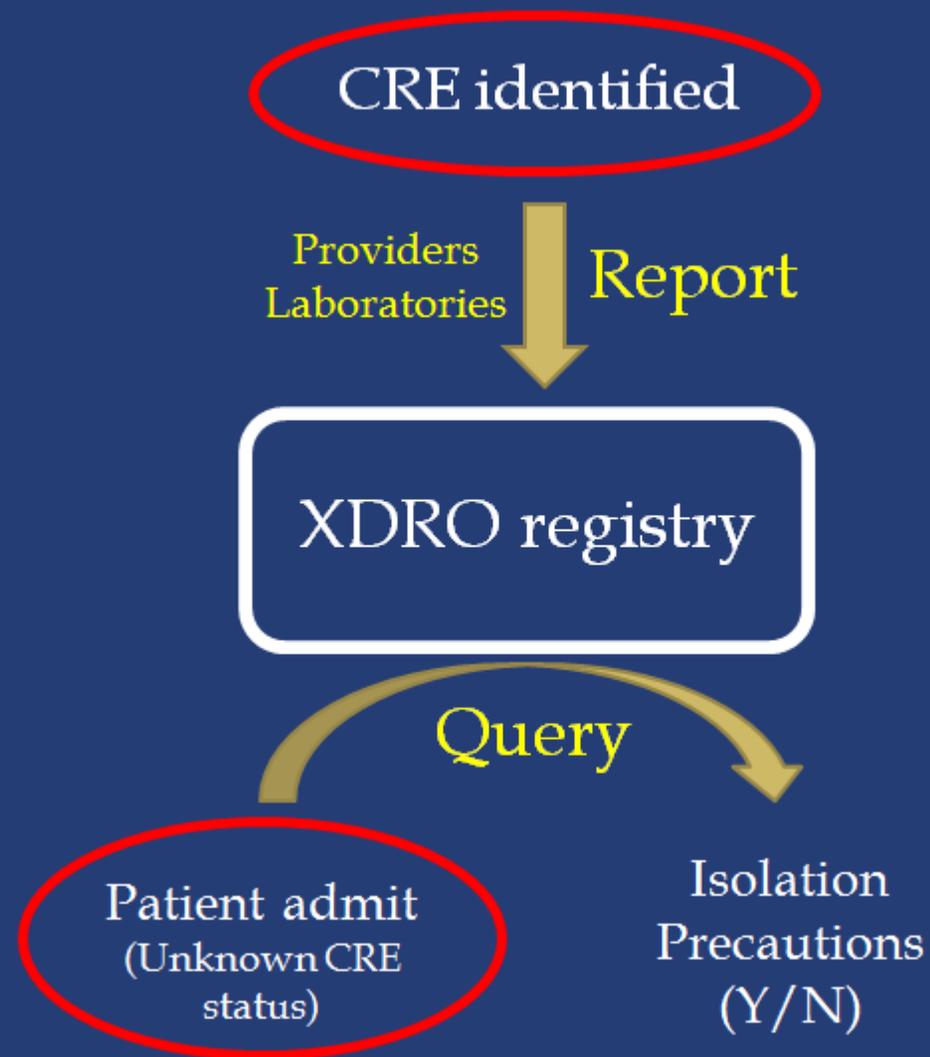
IL CRE Detect and Protect Campaign. [More...](#)

CRE are reportable to IDPH via the XDR0 registry. Links: [[IDPH letter to facilities, September 2013](#)][[Reporting rule](#)]

XDR0 registry orientation webinar [[Slides](#)][[Recording](#)]

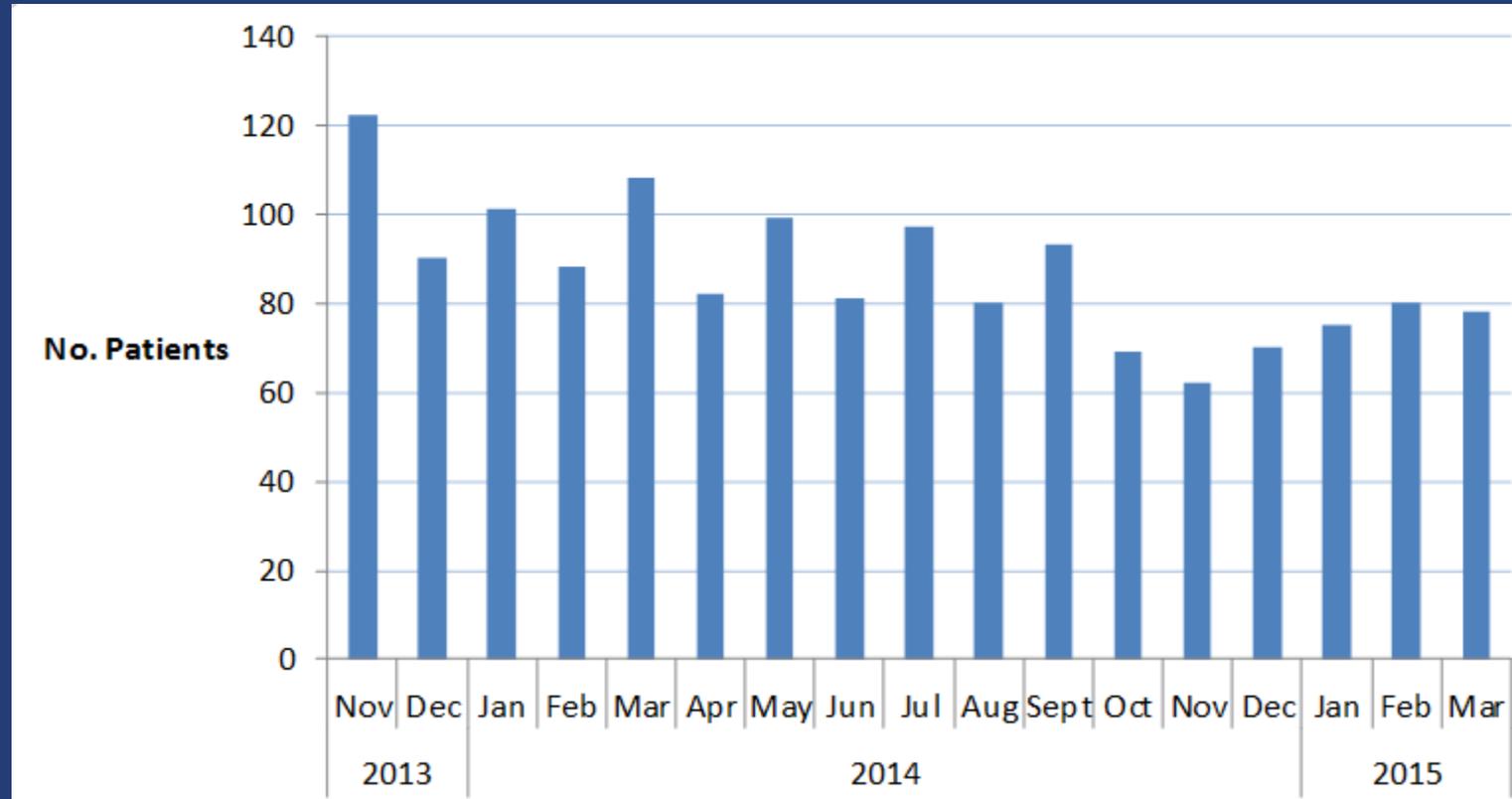
CDC guidance on control of CRE: [[The 2012 Toolkit](#)]

The XDR0 registry is a product of collaboration between IDPH, Medical Research Analytics and Informatics Alliance (MRAIA), and the Chicago CDC



CRE, Carbapenem-resistant Enterobacteriaceae

# Unique CRE-Infected Patients Reported to Statewide XDRO Registry



CRE, Carbapenem-resistant Enterobacteriaceae

# Bottomline

- Develop Controls Based on Epidemiology
  - Traditional control measures work
  - But spread of resistant bacteria among acute care, long-term acute care, & skilled nursing facilities is common
  - So, controls must be applied regionally (& beyond)
- Resistance Must be Tracked Regionally (& Beyond)
  - Our approach – Citywide culture surveys (REALM Project) & Statewide XDRO registry

**ASK THE AUDIENCE**



JOHNS HOPKINS  
M E D I C I N E

# Antimicrobial Stewardship

**Sara Cosgrove, MD, MS**

Associate Professor of Medicine, Division of Infectious Diseases

Director, Johns Hopkins Hospital Antimicrobial Stewardship Program

The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the views of the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry

# Outline

- Importance of antibiotic stewardship
- Implementation of antibiotic stewardship in a single facility
- Antibiotic stewardship interventions to decrease CDI
- Implementation of antibiotic stewardship across multiple healthcare facilities

# Why Does Antibiotic Stewardship Matter?

- Although antibiotics have saved countless lives, their use is not benign or risk neutral
- Antibiotic resistance occurs in populations and individual patients
- At least 5% of hospitalized patients experience an adverse reaction
  - Rash
  - Nephrotoxicity
  - *C. difficile* infection
- Few new antibiotics are being developed
- At least 30% of antibiotics used in hospitals are incorrect or not needed



# Executive Order -- Combating Antibiotic-Resistant Bacteria

## EXECUTIVE ORDER

-----

### COMBATING ANTIBIOTIC-RESISTANT BACTERIA

By the authority vested in me as President by the Constitution and the laws of the United States of America, I hereby order as follows:

Sec. 5. Improved Antibiotic Stewardship. (a) By the end of calendar year 2016, HHS shall review existing regulations and propose new regulations or other actions, as appropriate, that require hospitals and other inpatient healthcare delivery facilities to implement robust antibiotic stewardship programs that adhere to best practices, such as those identified by the CDC. HHS shall also take steps to encourage other healthcare facilities, such as ambulatory surgery centers and dialysis facilities, to adopt antibiotic stewardship programs.

BARACK OBAMA

THE WHITE HOUSE,  
September 18, 2014.



## Core Elements of Hospital Antibiotic Stewardship Programs

National Center for Emerging and Zoonotic Infectious Diseases  
Division of Healthcare Quality Promotion



## Summary of Core Elements of Hospital Antibiotic Stewardship Programs

- **Leadership Commitment:** Dedicating necessary human, financial and information technology resources.
- **Accountability:** Appointing a single leader responsible for program outcomes. Experience with successful programs show that a physician leader is effective.
- **Drug Expertise:** Appointing a single pharmacist leader responsible for working to improve antibiotic use.
- **Action:** Implementing at least one recommended action, such as systemic evaluation of ongoing treatment need after a set period of initial treatment (i.e. “antibiotic time out” after 48 hours).
- **Tracking:** Monitoring antibiotic prescribing and resistance patterns.
- **Reporting:** Regular reporting information on antibiotic use and resistance to doctors, nurses and relevant staff.
- **Education:** Educating clinicians about resistance and optimal prescribing.

# Two Levels of Implementation

- **Implementation of the program itself**
  - Leadership support
    - Financial
    - Intellectual
      - Public declaration that the work is important
      - Willingness to hold prescribers accountable
  - Determination of personnel
    - Program leadership
    - Program support
  - Access to antibiotic use data
- **Implementation of interventions to improve antibiotic use**
  - Guideline development
  - Targeted interventions
  - Feedback to prescribers

# AS Interventions to Reduce CDI

- All antibiotics can cause CDI
  - Most commonly implicated: clindamycin, 2<sup>nd</sup>/3<sup>rd</sup> generation cephalosporins, quinolones, carbapenems
  - Risk proportional to amount of antibiotic exposure
- Interventions to reduce exposure to these agents likely to impact CDI rates over time
  - Where are these agents used in your institution?
    - Surgical prophylaxis
    - Community-acquired pneumonia (CAP)
    - Urinary tract infection/asymptomatic bacteriuria (ASB)
    - Carbapenem use in patients not at risk for MDRGN
  - Emphasize avoiding unnecessary starts (ASB), narrowing therapy (CAP, carbapenems), reduced durations (UTI, CAP, prophylaxis)

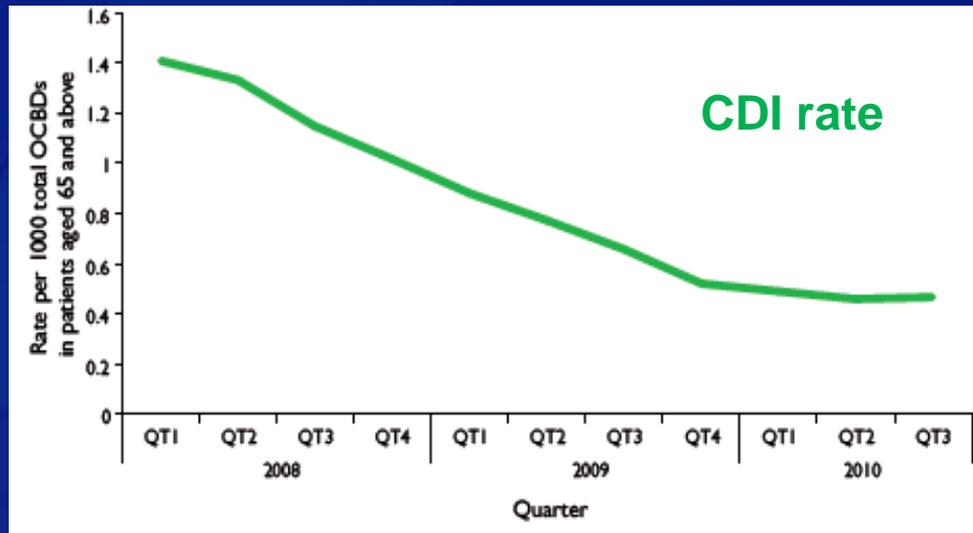
# AS Interventions to Reduce CDI

- Other considerations
  - Aggressive reduction in one class of antibiotics can lead to increases in other classes
  - Use of proton pump inhibitors associated with 1.4-2.8x increased risk of CDI
  - Over-testing for CDI
    - PCR-based testing detects colonization and infection
      - ~20% of hospitalized patients colonized
    - Not all hospital-acquired diarrhea is caused by CDI
  - Infection control interventions very important also

# Experience from Scotland

2008: Implementation of ASP in all hospitals

Focus on reduction in use of fluoroquinolones and 3<sup>rd</sup> generation cephalosporins



- Statistically significant decreases in:
  - 3<sup>rd</sup> generation cephalosporins resistance in *E. coli* (2-3% decreased across class)
  - Fluoroquinolone resistance in *P. aeruginosa* (12% to 6%)
- No statistically significant increases in resistance to other antibiotics

# Implementation Across Multiple Healthcare Facilities: Safety in Numbers

## ROCHESTER PATIENT SAFETY C. DIFFICILE PREVENTION COLLABORATIVE

HOME C. DIFF INFO HOSPITAL TOOLS LONG TERM CARE TOOLS CONTACT



Unity Health System

UNITY HOSPITAL

BACKGROUND

 **Background Information**  **Objectives**  **Members/ Organizations**

Slides courtesy of Elizabeth Dodds-Ashley, PharmD

# Summary Statement

Unity Health System



## C. diff Prevention Collaborative Antimicrobial Stewardship Workgroup

Thursday, April 10, 2014

### DID YOU KNOW? On a single day in Rochester, NY:

- **1 in 5 (20%)** hospitalized patients receiving antibiotics for treatment of urinary tract infections (UTI) had no documented symptoms of UTI<sup>1</sup>
- **5 in 6 (86%)** hospitalized patients receiving antibiotics for UTI did not meet criteria for UTI treatment<sup>1,2</sup>

AND

### Summary Recommendations

To minimize exposure to antimicrobials that may increase patients' risk for developing subsequent *C. difficile* infection, the stewardship workgroup recommends the following:

#### **AVOID OVERTESTING & TREATING ASYMPTOMATIC BACTERIURIA**

Order a urinalysis and urine culture only in cases where one of the following are met:

1. SIRS criteria without readily apparent alternative source of infection
2. Fever AND  $\geq 1$  urinary symptom\* are present
3.  $\geq 2$  urinary symptoms\* are present

*MENTAL STATUS CHANGES ALONE ARE NOT SUFFICIENT INDICATION TO TEST THE URINE  
DO NOT TREAT ASYMPTOMATIC BACTERIURIA IN MOST PATIENTS*

\*Urinary tract symptoms: dysuria, urgency, flank pain, shaking chills, new onset urinary incontinence, frequency, gross hematuria, suprapubic pain<sup>2</sup>

#### References:

1. Stone ND, Ashraf MS, Calder J et al. Infect Control Hosp Epidemiol 2012;33:965-77/
2. Loeb M, Brazil K, Lohfeld. BMJ 2005;331:669.

# Community Acquired Pneumonia Intervention

## Doxycycline for CAP – A Rochester City-Wide Collaborative C difficile Prevention Strategy

The RGH Infection Prevention (IP) and Antimicrobial Stewardship Program (ASP) participate in a Rochester city-wide Clostridium difficile Prevention Collaborative whose focus is to reduce the incidence of C difficile in our community. The collaborative agreed to initiate a uniform antibiotic intervention across all four Rochester hospitals (RGH, Unity Hospital, Strong Memorial Hospital, and Highland Hospital) for Community Acquired Pneumonia (CAP) that consists of two goals:

1. to reduce the use of fluoroquinolones, a drug class well-recognized for their associated high-risk for C difficile
2. to encourage use of doxycycline when applicable as doxycycline has recently been described as having a potentially protective role against C

From this, the ASP teams suggest that for patients hospitalized with non-ICU CAP, moxifloxacin be reserved for patients with severe penicillin allergies only. Those with no allergy, or mild to moderate penicillin (and no cephalosporin) allergy, a beta-lactam with PO doxycycline is the preferred treatment regimen. Three oral beta-lactam regimens with doxycycline are also provided below.

The ASP team would like to emphasize that these recommendations are for empiric therapy of non-ICU CAP.

- Patients admitted to ICU or MAT unit should continue to be prescribed either a macrolide (i.e. azithromycin) or moxifloxacin according to guidelines for empiric coverage of Legionella.
- The microbiologic evaluation for the bacterial pathogen should still be performed, such as

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